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TREATISE ON HERNIA:

COMPRISING THE

Surgical Anatomy, Operative Surgery,

AND

TREATMENT OF THAT IMPORTANT DISEASE

IN ALL ITS FORMS.

AS ALSO,

A NEWLY PROPOSED OPERATION FOR THE RELIEF OF

STRANGULATED HERNIA.

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TO
THE PRESIDENT, VICE-PRESIDENTS, COUNCIL,
OFFICERS, AND MEMBERS
OF THE
BRITISH MEDICAL ASSOCIATION,
THESE PAGES
Are respectfully Dedicated,
BY
THEIR DEVOTED SERVANT AND FELLOW-LABOURER
IN
THEIR ARDUOUS STRUGGLES TO EMANCIPATE THE
MEDICAL PROFESSION
FROM THE DEGRADING FETTERS WHICH AT PRESENT ENCUMBER
ITS EXISTENCE AS A SCIENCE,
MALCOLM W. HILLES.

7, Duke Street, Westminster, London.

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HERNIA.

THE term Hernia is made use of in surgery, to indicate the protrusion of any viscous from its containing cavity ; as, however, the abdominal viscera are much more frequently protruded than the thoracic or cranial, the word Hernia, when used without adding the name of the cavity from which the viscous protrudes, always implies an escape of one or more of the viscera of the abdomen.

Rupture was the term used by the older surgeons, from an erroneous idea that the hernial tumour escaped from the abdomen in consequence of a rupture of some part of the abdominal parietes : such has now been, long since, ascertained not to be the case, as the viscera escape by causing the dilatation of some of the apertures or canals that exist in the abdominal parietes, without producing any rupture.

Several divisions have been made of this disease. That in most general use is according to the region of the abdomen in which the hernia appears. In this division we have several species namely, *inguinal*, *femoral*, *umbilical*, *ventral*, *obturator*, *diaphragmatic*, *perineal*, *vaginal*, *pudendal*, and *sciatic*.

Inguinal hernia is so called from its appearance in the inguinal region or groin ; of it we have two varieties, one named *oblique* inguinal hernia, from the oblique direction which the tumour takes between the abdominal muscles, following the course of the spermatic chord, whence it is also occasionally called *spermatocele*—the other is called *direct* inguinal hernia, from its protruding directly forwards through the external abdominal ring.

Femoral hernia appears in the upper inner and anterior part of

the thigh, where it descends beneath Poupart's ligament on the inner side of the femoral vessels.

Umbilical hernia protrudes through the umbilicus, taking the course of the umbilical chord.

The term *Ventral hernia* indicates the protrusion of one or more of the viscera through some other region of the abdomen than those specifically mentioned; the situations where this species of hernia most frequently occurs, are at the linea alba, the lineaæ semilunares and transversæ. The other forms of the disease are of minor importance; they are sufficiently indicated, for the present, by their names.

Another division of hernia, and one which is of essential importance in practice, has arisen from the different conditions in which the tumour may happen to be; thus it may be either *reducible* or *irreducible*.

Reducible hernia is that species which can be returned into the abdomen.

Irreducible hernia may be either *simply irreducible*, *incarcerated* or *strangulated*.

Simply irreducible hernia is that species which from adhesions or other causes cannot be returned into the abdomen, yet is at the same time unattended by any dangerous symptoms.

In *incarcerated hernia* a certain degree of constriction exists, on either the intestines or omentum, which interferes partially with the functions of the viscera, but not so as to bring the life of the patient into immediate danger.

Strangulated hernia is one of the most formidable diseases the surgeon has to contend against; in it a stricture exists, which pressing on the protruded viscera, produces a train of violent symptoms, which if not relieved will terminate fatally.

The ancient surgeons dwelt much on the importance of ascertaining the nature of the contents of the hernial tumour, whether intestine, omentum, or both—hence another division has been made. When the tumour is wholly composed of intestine, it is named *enterocele*; of omentum, *epiplocele*; and where it consists of both intestine and omentum, *entero-epiplocele*. Accordingly they have laid down different symptoms by which the practitioner, according to them, may be enabled to come to a decision on the subject; later observation has however proved that these are not to be depended upon, nor is it indeed a matter of

much consequence, as equally acute symptoms frequently appear from strangulation of the omentum as of the intestines. It occasionally happens, though very rarely, that the bladder is protruded so as to form a hernial tumour, to this the term *cystic hernia* is applied.

In addition to these we meet with the congenital and infantile hernia. These are modifications of the inguinal species: their nature will be described hereafter.

INGUINAL HERNIA

is by far the most frequent of all, at least in the male subject, in consequence of the greater extent of the inguinal or spermatic canal in this sex—in the female, on the contrary, femoral hernia is more frequent, from the greater breadth of the pelvis, and the consequently greater extent of the femoral ring. We shall first direct attention to

OBLIQUE INGUINAL HERNIA.

In this form of the disease, the hernia takes the course of the spermatic canal with the spermatic chord; that is, it escapes from the abdomen at the internal abdominal ring, about midway between the spine of the ilium and the symphysis pubis, descends obliquely forwards and inwards, escapes throughout the external abdominal ring, and finally descends into the scrotum.

To dissect this species of hernia, place the subject on the back, extend the limbs, and place a support beneath the pelvis. Make a vertical incision through the integuments, from the umbilicus to the symphysis pubis; from the upper extremity of this carry another incision, downwards and outwards, to the spine of the ilium. Carefully raise the skin, commencing at the umbilicus, and throw downwards, on the thigh, the triangular flap thus formed. On doing so, a dense layer of cellular substance is brought into view—this is the *superficial fascia* of inguinal hernia. This is perfectly continuous with the common subcutaneous cellular tissue beneath the integuments in other regions of the body, and differs but little from it, except in being a little denser in structure, and of more importance from its connexion with hernia. *Above*, the superficial fascia is continuous with the cellular tissue covering the lower surface of the thorax, and upper part of the abdominal muscles; *inferiorly* it descends over Poupart's

Ligament into the thigh, and there becomes continuous with the superficial fascia of the femoral region; nearer the pubes it passes over the spermatic chord in the male, and descends into the scrotum and perineum, where it identifies itself with the loose cellular tissue of these regions. On the *mesial* line, the superficial fascia descends from the linea alba, on the dorsum of the penis, and here forms a tolerably dense structure, the false suspensory ligament of the penis, which connects this organ to the abdominal parietes. In the female it is loaded with a quantity of adipose tissue, and descends into the labium. The cutaneous surface of the superficial fascia is rough and cellular, and is intimately connected to the integuments; its deep surface is more compact and smooth, and is applied against Scarpa's fascia, which thus separates it from the abdominal muscles. The use of this fascia is to allow of the free motions of the integuments on the abdominal muscles, and to assist these in the support of the abdominal viscera—for this latter purpose it presents, in some of the lower animals, a highly elastic structure.

Some anatomists have divided the superficial fascia into several layers; this is quite an arbitrary division and without any practical advantage, as the number of layers varies in almost every subject, and depends much on the dexterity of the operator; its thickness also varies much in different individuals, in some being but a few, in others many, lines in depth. In it we meet with several superficial arteries, veins, nerves, and lymphatic glands. The *arteries* are the external epigastric, and branches from the external circumflexa illi, and pudic arteries. They arise from the femoral artery a little below Poupart's ligament, ascend in front of the ligament, and are lost in the superficial fascia and integuments. The external epigastric is the largest, it ascends obliquely inwards, towards the umbilicus, where it terminates. One or more of these vessels are in general wounded in the operation for the relief of strangulated inguinal hernia; the hemorrhage is easily restrained. The *veins* accompany the arteries. The *nerves* are small, and are derived from branches of the lumbar plexus. The *lymphatic glands* are four or five in number; they take a nearly transverse course, parallel to Poupart's ligament, some lying a little above, others somewhat beneath the ligament. They are named the *superior* inguinal glands, to distinguish them from another set of inguinal glands, met with below Poupart's ligament, more numerous, and

arranged in the vertical direction ; they are contained in a sheath or capsule formed in the superficial fascia. The superior set communicate with the absorbents of the genital organs, hence they become inflamed in all diseases affecting these parts; not unfrequently, too, some absorbents from the perineal and anal regions communicate with them, and thus swelling may be induced in them from disease of these parts. The *inferior* inguinal glands, on the contrary, communicate with the absorbents of the lower extremity. Chronic enlargement of these glands may be mistaken for an inguinal or femoral hernia.

Raise the superficial fascia from beneath, commencing a little below Poupart's ligament, and continue the dissection upwards to the umbilicus. A distinct layer of cellular tissue, "Scarpa's fascia," is exposed. This is firmly attached to and appears to arise from the fascia lata, about half an inch below Poupart's ligament, whence it ascends over the ligament, to be gradually lost on the outer surface of the external oblique muscle ; it is sometimes described as the deep layer of the superficial fascia, with which it is so intimately connected, as to give to this the appearance of being firmly attached to Poupart's ligament ; they are, indeed, with difficulty separated.

On Scarpa's fascia femoral hernia rests when it turns up over Poupart's ligament. These fasciæ, excepting the skin, form the most superficial coverings of an inguinal hernia. From the free communication between the cells of the superficial fascia, and those of the surrounding cellular tissue, fluids are rapidly transmitted from one to the other : this is particularly manifest in anasarca and extravasations of urine.

On raising Scarpa's fascia the outer surface of the external oblique muscle is brought into view ; this is here perfectly tendinous, in order that it may the more effectually support the abdominal viscera ; it forms, with the fellow of the opposite side, a broad sheet of tendon, extending directly across the lower part of the abdomen. Each tendon is somewhat triangular in shape : one margin is turned inwards, and unites with its fellow on the mesial line, to form the linea alba ; a second is directed upwards and outwards, slightly concave, and gives attachment to the fleshy fibres of the muscle ; the third margin is turned downwards and outwards ; and here presents a thickened condensed chord, named Poupart's ligament.

The tendinous fibres of the external oblique muscle are distinct and well marked : by far the greater number take a direction downwards and inwards ; a few may be observed to decussate with these, taking an oblique course upwards and inwards. As we trace them toward the pubes, they increase in strength and density, and having arrived within about an inch and a half of this bone, they separate into two bands, and thus leave an interval between them, named the *external abdominal ring*. The bands are named the pillars of the ring. One of them, the *internal*, lies *anterior* and *superior* to the other ; it is a broad flat sheet of tendon, which, passing inwards, descends in front of the symphysis pubis, into which it is implanted, decussating with its fellow of the opposite side. A few fibres pass from it to be continuous with the fascia lata of the opposite side ; others may be traced descending on the dorsum of the penis, contributing to form the true suspensory ligament of this organ. The *external* pillar of the ring, stronger and shorter than the other, is a continuation of Poupart's ligament : it is a round fibrous chord ; it descends inwards, and is inserted into the spine or tubercle of the pubes ; on it the spermatic chord rests as it escapes through the ring. Here the external pillar is excavated on its superior surface (as will be seen in a future stage of the dissection) to accommodate the chord, and thus preserve it from injury.

Inferiorly, or towards the thigh, the *descending* fibres of the external oblique muscle become condensed, and form *Poupart's ligament*, a dense fibrous chord, which descends inwards from the anterior superior spinous process of the ilium to the pubes, into which it is implanted by two attachments: one, already described as the external pillar of the ring, is inserted into the spine or tubercle of the pubes ; the other is an expansion from this, and forms a broad thin ligament, which ascends obliquely inwards, to be inserted into the internal extremity of the linea innominata ; it is named *Gimbernat's ligament*, or the third insertion of the crural arch. It lies superior and posterior to the external pillar of the ring, or second insertion of Poupart's ligament. It is more immediately connected with femoral hernia, with which we shall hereafter describe it more minutely.

Near the ilium Poupart's ligament is thin and weak, but it increases much in density as it approaches the pubes. Its *inferior* margin slightly concave, and directed somewhat forwards, gives attachment to the iliac portion of the fascia lata. To its *superior*

edge are connected the external and internal oblique, and transversalis muscles, and the transversalis and iliac fasciæ. By some this ligament is described as a distinct structure ; it is of little consequence whether it be considered as such, or merely the lower margin of the external oblique muscle. It is of use in strengthening the abdominal cavity inferiorly, and thus preventing the protrusion of the viscera ; it also affords attachment to muscles and fasciæ, and protects the femoral vessels and spermatic chord. From its connexion with so many fasciæ, it is particularly necessary, in all our attempts at the reduction of hernia, that Poupart's ligament should be as relaxed as possible; this is best accomplished by raising the upper part of the body, so as to relax the abdominal muscles, and at the same time flexing and rotating the thigh inwards, so as to relax the fascia lata ; in some subjects it is very indistinct, and can with difficulty be discovered during life.

A few tendinous fibres of the external oblique muscle decussate with those just described : they are the *intercolumnal bands*. They arise from near Poupart's ligament, ascend inwards, forming curves convex towards the pubes, and are gradually lost in the tendon as they approach the linea alba ; towards the ilium they are indistinct, but near the pubes they become strong and well marked ; in general one stronger than the rest rounds off the apex of the external abdominal ring, and thus assists in restraining the increase of this opening. The use of the intercolumnal bands, is to prevent the separation of the descending fibres of the external oblique, between which intervals occasionally exist, exposing the fibres of the internal oblique muscle.

Hitherto the external abdominal ring has not been sufficiently apparent ; it is concealed from view by a layer of cellular tissue, the external spout-like or Camper's fascia, or intercolumnal fascia, which descends from the edges or margins of the ring, on the spermatic chord, upon which it is insensibly lost. Some describe this fascia as being derived from the intercolumnal bands. Scarpa considers it to be a prolongation of the fascia which has received his name. It is so intimately connected with all these structures, that it is impossible to assign to it any distinct origin. It forms the third covering of an inguinal hernia, whether oblique or direct.

On dissecting off this fascia, the *external abdominal ring* is exposed. This may be now seen to be, as already described, an opening in the external oblique tendon, formed by the divergence

of its *descending* fibres; it transmits the spermatic chord in the male, the ligamentum teres in the female. It is triangular in shape; the *apex*, directed upwards and outwards, is rounded off by the intercolumnal bands; its *base* inferiorly is formed by the crest of the pubes; its *internal* margin, the longest, is formed by the internal pillar of the ring, its *external* margin by the external pillar; its greatest length corresponds to that of its internal margin, and varies from one inch to one inch and a half; it is the outer or anterior opening of the inguinal or spermatic canal; through it an inguinal hernia emerges, to descend into the scrotum.

If the spermatic chord be now cut across, a little beneath the ring, and gently raised, it will be seen that it has escaped through this aperture, resting, not on the bone, but upon the external pillar of the ring, and that, behind the external abdominal ring, some fibrous structures exist which assist in preventing the protrusion of hernia through this opening, directly from behind, or, in other words, prevent the formation of a direct inguinal hernia; these are Colles's fascia, and the conjoined tendons.

Colles's fascia, or the *triangular ligament of inguinal hernia*, is liable to much variety, being in some subjects well marked, in others altogether wanting; it lies behind the external abdominal ring, in front of the conjoined tendons, and partially concealed by the internal pillar of the ring. It is formed by a few fibres, which are derived from the posterior surface of the external oblique tendon of the opposite side; the ligaments of either side therefore decussate. Its base is implanted into the crest of the pubes; one margin is towards the linea alba, the other is free, and looks upwards and outwards.

The *conjoined tendons* lie behind, and to the outside of the preceding: they are the united tendons of the internal oblique, and transversalis muscles, which here pass in front of the rectus muscle, to be inserted into the upper part of the symphysis and crest of the pubes; the external margin of the conjoined tendons is prolonged beyond the outer edge of the rectus muscle; it here is inferiorly implanted into the linea innominata, where it is continuous with Gimbernat's ligament. Above this the transversalis fascia is implanted into it; here, indeed, the two structures frequently appear to be continuous one with the other.

From the great strength and transverse extent of the conjoined tendons, and their position immediately behind the external abdo-

minal ring, they contribute much to the security of the abdomen in this situation, and thus prevent the formation of direct inguinal hernia.

Having thus examined the external abdominal ring, we next proceed to the description of the *inguinal or spermatic canal*. This, it should be carefully borne in mind, is an oblique canal or passage between the abdominal muscles, which transmits the spermatic chord in the male, the ligamentum teres in the female; it possesses two openings, one at either end, named the abdominal rings, one of which, the external, we have already described; the other, the *internal*, is situated about midway between the symphysis pubis and the spine of the ilium, and is as yet concealed from view. Divide the tendon of the external oblique from the external abdominal ring, upwards and outwards, towards the ilium, parallel to and a little above Poupart's ligament; the greater part of the inguinal canal is now exposed, together with the spermatic chord. This latter presents here a flattened appearance, having its component parts partially spread out, so as not to suffer from the action of the abdominal muscles.

The *inguinal or spermatic canal* is, as we have already mentioned, an oblique canal between the abdominal muscles, which transmits the spermatic chord in the male and the ligamentum teres in the female. It commences at the *internal abdominal ring*, as yet concealed from view by the lower margin of the internal oblique muscle. This is an opening in the transversalis fascia, situated about midway between the spine of the ilium and the symphysis pubis, but somewhat nearer the former, about three quarters of an inch above Poupart's ligament; from this the canal descends forwards and inwards between the oblique muscles, and terminates at the external abdominal ring. Its length is about one inch and a half, if we measure the distance between the two nearest points of the two rings; three inches, if we measure between the two furthest points of these openings, and two and a half inches if we measure between the intermediate points.

The inguinal canal is bounded, *above*, by the lower margins of the internal oblique and transversalis muscles, *below* by Poupart's ligament, *in front* by the external oblique tendon and the lower margin of the internal oblique, *behind* by the transversalis fascia, the conjoined tendons, Colles's ligament, and occasionally a few fibres of the internal oblique.

The *superior boundary* of the inguinal canal, we have just said, is formed by the lower margins of the internal oblique and transversalis muscles; these muscles are here intimately connected, particularly as we approach the pubes—towards the ilium they are partially separated. Beneath the former, the spermatic chord may be seen to emerge, as it descends; a few muscular fibres pass off along with it, which form the cremaster muscle. In some subjects a different arrangement exists; which is, that the spermatic chord passes out between the fibres of the internal oblique, some of which thus lying beneath the chord, this structure then escapes through a perfectly muscular opening. Now as hernia takes the same course as the chord, it follows, that the tumour escaping through a muscular aperture, will be much exposed to constriction; hence one of the reasons why the stricture is so frequently met with in strangulated oblique inguinal hernia, at the lower margin of the internal oblique muscle. In this stage of the dissection, the extent of origin of the internal oblique muscle from Poupart's ligament may be observed; it in general arises from the external two-thirds and upper surface of the ligament, but is liable to much variety in this respect; the fibres descend inwards, to terminate in the conjoined tendons.

The *cremaster muscle* arises not only from the lower margin of the internal oblique, but takes a few fibres from the transversalis muscle, from the neighbouring surface of Poupart's ligament, and from the pubes a little external to its tubercle; from these different origins, its fibres descend around the spermatic chord, but chiefly on its outer and anterior surface, forming a series of loops, the concavities of which are directed upwards, and are finally implanted into the outer surface of the tunica vaginalis, and into the scrotum, to the lower part of which they descend. Between the fibres of the muscle, the *spermaticus superficialis* nerve, a branch from the *ilio-scrotal*, descends, to be lost in the coverings of the testis. The *cremaster muscle* is of use in supporting and raising the testicle—it is seldom well marked except in cases of old hernia, hydrocele, or disease of the testis, when its fibres become strong and distinct—it forms the fourth covering of an oblique inguinal hernia.

Poupart's ligament bounds the inguinal canal *inferiorly*. Near the internal ring, the chord is about three quarters of an inch above Poupart's ligament, but, as it descends, it gradually

approaches the ligament, until at length it lies embedded in its upper surface, which is grooved for its protection. This close relation between the chord and Poupart's ligament should not be forgotten in our operations for the relief of strangulated femoral hernia, as the chord is much endangered, should we adopt the proposal recommended by some, of cutting directly upwards.

The *anterior* boundaries of the inguinal canal have been already sufficiently described. Its *posterior* walls are the fascia transversalis and the conjoined tendons—this latter structure forms but a small portion of the posterior boundary of the canal—it lies behind the external abdominal ring. The *transversalis fascia* will be better seen immediately.

Cut through the lower margin of the internal oblique muscle, and raise it gently from the outer surface of the transversalis—the remainder of the inguinal canal will then be still farther exposed, as also the *internal abdominal ring*.

This opening is formed by the passage of the spermatic chord through the transversalis fascia—as the chord passes through the fascia, it draws with it, as it were, a cellular prolongation from the fascia: this descends, and is gradually lost upon the chord; it is named the *fascia propria*, or *internal spout-like fascia*. It forms the fisth, or the immediate covering of the hernial sac, hence its name of *fascia propria*. It is well exposed by gently drawing downwards the spermatic chord.

Dissect off the fascia propria, and the internal abdominal ring, although less defined than the external, is completely exposed—it is the inner opening or commencement of the inguinal canal—it may be now seen to be a little nearer the ilium than the symphysis pubis, its inner margin being precisely midway between these two points. It lies nearly opposite the external iliac artery, and about one half or three quarters of an inch above Poupart's ligament. Directly *above* it the lower fibres of the transversalis muscle cross from their origin, from the external third or half of Poupart's ligament, almost transversely inwards, to become identified with the internal oblique muscle, and implanted with it into the conjoined tendons. Occasionally, as Mr. Guthrie has described, a few fibres of the transversalis muscle pass behind the chord. Along the *internal* and *inferior part* of the internal ring and contained in the transversalis fascia, ascends the *epigastric artery*.

This artery arises from the internal iliac, a little above Poupart's

ligament; it at first descends, then curves upwards, winding round the cul de sac of the peritoneum, and then ascends inwards, enters the sheath of the rectus muscle, and terminates by anastomosing with the internal mammary artery. It lies about *a quarter of an inch* distant from the chord.

From the relation of this artery to the internal ring, it is necessarily much endangered in dividing the stricture in cases of strangulated inguinal hernia, as the neck of the sac is only separated from the artery by the spermatic chord; hence arises the never-to-be-forgotten rule, of dividing the stricture in cases of *oblique* inguinal hernia *upwards and outwards*, in cases of *direct* inguinal hernia *upwards and inwards*, and in *doubtful* cases directly *upwards*. The epigastric artery is accompanied by one or two veins; if by one, the vein lies to its inner or pubal side; if by two, the artery lies between the veins.

The following measurements of the parts connected with hernia, are given by Sir A. Cooper.

| | M. | F. |
|--|-----------------|----------------|
| anterior superior spinous process of the ilium | 5 $\frac{3}{4}$ | 6 |
| tuberosity of the pubis | $1\frac{1}{8}$ | $1\frac{3}{8}$ |
| inner margin of the lower opening of the abdominal canal | $0\frac{7}{8}$ | 1 |
| inner edge of the internal abdominal ring | 3 | $3\frac{1}{4}$ |
| to the middle of the iliac artery | $3\frac{1}{8}$ | $3\frac{3}{8}$ |
| iliac vein | $2\frac{5}{8}$ | $2\frac{3}{4}$ |
| origin of the epigastric artery | 3 | $3\frac{1}{4}$ |
| course of the epigastric artery on the inner side of the internal abdominal ring | $2\frac{3}{4}$ | $2\frac{7}{8}$ |
| From the middle of the lunate edge of the fascia lata anterior edge of the crural arch to the saphena vein | $3\frac{3}{4}$ | $2\frac{3}{4}$ |
| symphysis pubis to the middle of the crural ring | $2\frac{1}{4}$ | $2\frac{8}{3}$ |

Having attentively examined the relative anatomy of the internal abdominal ring, we may now proceed to consider the *transversalis fascia*. This is a layer of condensed cellular tissue or fascia, situated between the transversalis muscle and the peritoneum, and particularly well marked, *inferiorly*, where the internal oblique and transversalis muscles are deficient. It may be examined from

without, by raising the transversalis muscle, or from within, by detaching the peritoneum.

Superiorly, the transversalis fascia is gradually lost in the loose cellular tissue which connects the peritoneum on its anterior and posterior surfaces to the abdominal parietes, but *inferiorly* becomes strong and well marked. Here, on the *outer* side, it is attached to the inner edge of the crest of the ilium, more *internally* to Poupart's ligament, behind which it unites with the fascia iliaca to prevent the protrusion of hernia beneath this ligament—still more internally, or opposite the femoral vessels, it descends into the thigh, forming the anterior layer of the canal in which these vessels are lodged; still nearer the pubis, it is attached to the conjoined tendons, and the outer edge of the rectus muscle, a layer of it passing also behind this muscle to be continuous with that of the opposite side.

At the point where the spermatic chord perforates the transversalis fascia, namely the internal abdominal ring, the fascia frequently presents a well defined semilunar border which bounds the ring to its inner side—in other cases it terminates gradually in this direction—in all instances a prolongation is derived from it which descends on the spermatic chord, and forms the fascia propria, or fascia spermatica, of Sir A. Cooper. Some anatomists describe the transversalis fascia as being composed of two layers, between which the epigastric artery ascends, one of these being attached to the edge of the rectus muscle, the other passing behind the muscle to the opposite side. The transversalis fascia is of use in strengthening the abdominal parietes inferiorly, where a deficiency exists in the internal oblique and transversalis muscles. From its connexion with the transversalis and rectus muscles, it is made tense by the action of these, and is thus rendered still more capable of opposing the protrusion of a hernia.

We have now described what is termed the *anatomy of oblique inguinal hernia*, and in doing so have pointed out the oblique descent of the spermatic chord in the male, and the ligamentum teres in the female, along the inguinal or spermatic canal. Through this canal an oblique inguinal hernia descends, and, as it passes downwards, it receives the different coverings we have described.

Thus, the hernia is first protruded against the internal abdominal ring, it pushes before it the peritoneum, which forms the hernal sac, emerging through the ring it descends in front of the sper-

matic chord, and here receives a covering from the fascia propria; descending still further, it escapes beneath the lower margin, or between the fibres of the internal oblique muscle, here it enters the sheath of the cremaster muscle, and continues its course to the external abdominal ring; it now, turning forwards, passes through this opening, where it becomes invested by the external spout-like fascia; it now descends into the scrotum, covered still further by Scarpa's fascia, the superficial fascia, and the integuments. It thus is covered by the *integument*, the *superficial fascia*, Scarpa's *fascia*, the *external spout-like fascia*, the *sheath of the cremaster muscle*, the *fascia propria*, and the *peritoneum*, forming the hernial sac.

As a hernia descends into the scrotum, beneath the coverings of the spermatic chord, it finally arrives immediately above the testis, in which position it is retained by the attachment of the spermatic coverings to the upper and back part of this organ, where its vessels and nerves enter.

Now the principal point to be attended to, in the anatomy of oblique inguinal hernia, are—1st. Its *coverings*; 2d. The part of the canal where stricture most frequently occurs; 3d. Its relation to the epigastric artery, to the spermatic chord, and the testis; 4th. The varieties occasionally met with in this disease.

From the distinct enumeration we have just given of the coverings of an oblique inguinal hernia, it might be concluded that a surgeon, when called upon to operate for the relief of a strangulated hernia, should meet with little difficulty in exposing the hernial sac, being enabled from his knowledge of anatomy to cut through layer by layer, with the same accuracy as he could turn over the leaves of a book. Such is not the case: these parts are so liable to vary as to extent and stricture, and are so frequently matted together by the adhesive inflammation, that the practitioner, however perfect he may be in anatomy, is obliged to proceed with the greatest caution, dividing layer after layer, as they appear, and can in no instance, *a priori*, ascertain the depth of the hernial coverings; in some, the motions of the intestines may be seen through the parietes, in others, the superficial fascia alone is an inch thick.

The *seat of stricture* in oblique inguinal hernia has now been fully ascertained to be in general either at the lower margin of the internal oblique muscle, or at the internal abdominal ring; and this we should have been led to expect, from the muscular

relations of these parts, at the same time it should be recollected, that the stricture is not unfrequently met with in the neck of the hernial sac, from the thickening produced in the peritoneum by the pressure exercised upon it, and in old cases of hernia may be at the external abdominal ring. Indeed, the hernia may be strangulated in the interior of the sac, by the intestine perforating the omentum, or by an adventitious band of lymph. Such a state of parts has been found in the cavity of the abdomen, when no hernia whatever has been formed, thus causing an internal strangulation beyond the power of surgery.

The *epigastric artery* is the only vessel of consequence endangered in dividing the stricture, and this only when the constriction exists in the interior of the inguinal canal.

We have already shown, that at the internal abdominal ring this vessel lies *internal* and *inferior* to the neck of the sac, whence it ascends above the hernia, still to its inner side : to avoid it, therefore, we should cut upwards and outwards ; if we incline the knife *inwards*, there is but little chance of the artery escaping. Some surgeons speak of the *spermatic artery* being also endangered ; this is hardly possible, as the vessel lies beneath the hernia throughout, and could be wounded only by cutting downwards, unless in old cases of hernia, where the component parts of the chord are spread out, so as to admit of the descent of the hernia between them, the spermatic artery may be then found in front of the hernial sac, and thus may be wounded. The other parts of the chord, viz. the *vas deferens*, *spermatic veins*, *nerves*, &c. in such cases are also liable to displacement, so that the hernia may finally make its way behind the spermatic chord altogether ; in these cases, as it descends it escapes behind the testis, and thus may be found below this organ.

We have already anticipated a good many of the *varieties* met with in the economy of oblique inguinal hernia ; of these the most prominent are—the *seat of stricture*, its *relations* to the *ehord* and *testis* ; the non-existence of a distinct hernial sac, as occurs in protrusion of the *cœcum* and *bladder*, and in congenital and infantile hernia, and the complications, caused by the presence of other diseases. The first two of these subjects have been sufficiently noticed already ; the others we shall dispose of as we proceed.

OPERATION FOR THE RELIEF OF STRANGULATED INGUINAL HERNIA.

THE usual remedies for the relief of strangulated hernia, namely, the taxis, the warm bath, bleeding, the tobacco enema, the application of cold to the tumour, &c. having been resorted to without success, the Surgeon has no alternative; he must proceed to the operation.

Here we would observe, that in the application of the taxis the position of the patient should be particularly attended to; such a posture should be selected as will relax the parts as much as possible, and at the same time not interfere with the manipulations of the Surgeon. Thus the patient should be placed on an inclined plane, having the head and shoulders supported, and his thighs flexed on the abdomen. The Surgeon raises the hernia with one hand, and with the other presses the tumour in the direction of the internal abdominal ring, attempting first to return that which has last descended. By a perseverance in this plan for ten or fifteen minutes together, the hernia is frequently reduced.

We should in all cases take especial care not to postpone the operation to too late a period, as the symptoms in many cases run rapidly to a fatal termination, and gangrene may have supervened before the practitioner has even thought of its occurrence. In such a case the operation is not only useless, but injurious; it hurries the fatal catastrophe, and casts a stain on the practitioner, and his profession. We should here content ourselves with cutting into the tumour, so as to give exit to its contents, and permit of the separation of the sloughs, and then trust to nature, aided by art, for the establishment of an artificial anus, and the possible recovery of the patient.

In strangulated hernia, the *urgency* of the symptoms must be our guide, as one case may be fatal in a few hours, whilst another may recover a strangulation of a week's duration. In making use of the words *urgency* of the symptoms, we do not merely allude to their acuteness—no!—in some, and particularly in old persons, the disease may terminate fatally by the constitutional irritation it induces, without any very violent symptoms.

We must also be certain that the disease for which we are about to operate is *hernia*, and in this case oblique inguinal hernia, as many diseases may be confounded with it. *Hydrocele* of the

tunica vaginalis presents many of the characters of inguinal hernia, especially when the fluid reaches as far as the external abdominal ring. We may be enabled to distinguish between them in the following manner: A hydrocele commences from below, a hernia from above; its shape is pyriform, the base beneath; a hernia is more elongated. Hydrocele is in general transparent; in it the spermatic chord may be distinctly felt below the external ring, by grasping it between the finger and thumb, and gently rolling it at the same time; the testis lies to the upper and back part of a hydrocele, beneath the tumour in a hernia. Still the diagnosis is in some cases difficult, from the varieties occasionally observed in both affections.

A hydrocele may be *combined with* an inguinal hernia, in this case the hernia will lie behind the hydrocele, consequently the operator is obliged to discharge the fluid (if the tumour be large), and then cut through the tunica vaginalis to the hernial sac.

A *varicocele* or *spermatocele*, a varicose state of the spermatic veins, has been frequently mistaken for a hernia; the diagnosis is simple. Place the patient in the recumbent posture—reduce the tumour—make pressure on the external abdominal ring—desire the patient to stand up—if the disease be a hernia, it will not re-appear; but if a varicocele, the pressure will rather increase it. Or we may apply the pressure immediately above the testis; in this way the varicocele will not re-appear, but a hernia will.

Mr. Pott relates a case of testitis or *hernia humoralis*, having been confounded with an inguinal hernia; in this instance (and it is only under such circumstances the mistake is likely to be committed) the testis had not descended into the scrotum, but was retained within the inguinal canal; the absence of the testis on that side of the scrotum at once enabled him to detect the true nature of the affection. It is stated that *chronic diseases* of the *testis* may be confounded with a hernial tumour; this is not likely, as, independently of the other symptoms peculiar to these diseases, the greater weight of the enlarged testis will enable us to recognise the affection.

Hydrocele of that part of the *spermatic chord* which is contained in the inguinal canal, is with some difficulty distinguished from hernia. Sir A. Cooper states that our diagnosis fails here. The tense state of the hydrocele, and the absence of constitutional symptoms at the same time, will assist us; should these latter be present,

as sometimes occurs when peritonitis sets in, the hydrocele will not participate in the inflammation of the peritoneum.

Enlargement of the inguinal glands sometimes confuses the practitioner ; here the absence of impulse on coughing, the position of the enlarged glands on the outer surface of the external oblique tendon, their circumscribed shape, or else their fluctuation, if matter have formed, will enable us to decide. *Chronic abscesses* connected with carious vertebræ, or diseased hip joint, sometimes point in the inguinal canal ; the symptoms attending these diseases, and the fluctuation of the matter in the abscess, will point out their nature.

From the necessity there exists of our avoiding the epigastric artery in operating for the relief of strangulated inguinal hernia, it is always desirable to ascertain, à priori, whether the disease is by *oblique* or *direct* descent ; in general the oblique course of the tumour along the inguinal canal in the former, will at once point it out ; but this means of diagnosis is not always present, as in oblique inguinal hernia of long standing the inguinal canal becomes obliterated, in consequence of the internal abdominal ring being dragged down behind the external ring, by the weight of the hernial tumour ; here the hernia passes directly backwards into the abdomen, as in the direct species ; should we be then unable to decide, our rule is in dividing the stricture to cut directly upwards, we thus avoid the epigastric artery.

The presence or absence of the symptoms of strangulated hernia will not avail us in forming our diagnosis in any case, as acute peritonitis presents precisely similar symptoms.

Having satisfied ourselves that the disease is strangulated oblique inguinal hernia, and that the operation is requisite to the preserving the life of our patient, we proceed to its performance, having first provided ourselves with the necessary instruments, &c. viz., a few scalpels and forceps, a scissors, one or two probe and sharp-pointed bistouries, tenacula, probes, lint, adhesive plaster, ligatures and bandages ; as also some gentle stimulant, such as port wine and water, to be administered in small quantities to the patient, as occasion may require.

The hair having been first removed from the pudenda, the patient is to be placed in the recumbent posture, on a table of convenient height, having his head and shoulders supported with pillows, and his legs hanging over the end of the table, with his feet resting on two chairs, or held by assistants.

Commence your first incision immediately above the external abdominal ring, continue it downwards along the mesial line and anterior surface of the tumour, to the bottom of the scrotum, so that no bag may be left for the receipt of the discharges; in this incision, the integument and superficial fascia are most probably divided, as also a few small arterial branches from the external pudic and superficial epigastric artery; should these bleed smartly, they should be secured with the ligature.

Sponge the surface carefully, and proceed to divide the different layers which cover the hernial sac, viz. Scarpa's fascia, the external spout-like fascia, the sheath of the cremaster muscle, and the fascia propria; this must be done by cautiously scratching an opening in each layer, through this a director is to be introduced upwards and downwards, and the fascia divided.

By these means the hernial sac will be exposed, it is recognised by its bluish transparent appearance; pinch it up between the fingers, and you thus feel the intestine and omentum within; raise it carefully, and make a small opening into it by holding the knife horizontally: the lower part of the sac should be selected for this purpose, as here the fluid in its interior collects, and thus separates the sac from the hernia; adhesions too, seldom exist in this situation. Through this aperture introduce the director, keeping it close to the inner surface of the sac, and divide the hernial sac freely in the direction of your first incision. A quantity of water instantly escapes, if intestine be present, and extensive adhesions do not exist. You now proceed to examine the contents of the tumour, these are most probably both omentum and intestine, the former in *front*, the latter *behind*; carefully spread out the omentum for two reasons, first, that you may ascertain that it is not the cause of the strangulation; second, it will thus protect the intestines from the knife.

Now examine for the stricture: this is best done by introducing the little finger along the front of the omentum towards the inguinal canal; it will be found to exist most frequently either at the lower margin of the internal oblique muscle, at the internal abdominal ring, or in the neck of the sac; it may be also at the external abdominal ring in cases of old hernia.

If the stricture should be at one of the three first mentioned parts, and that the inguinal canal retains its natural length, it will be necessary to slit up the external ring so as to bring the parts

more completely into view—the edges of the wound being separated, draw down the hernial sac, and passing Sir A. Cooper's probe-pointed bistoury upwards, guided by the finger, divide the stricture *upwards and outwards*. A small incision will be sufficient for this purpose.

The stricture having been divided, you carefully examine the condition of both omentum and intestine; if they be sound, you return them, the intestine first, by pressing that part first which has descended last, and next the omentum. Assure yourself, by the introduction of the finger, that the parts have been completely returned, and do not still lie in the inguinal canal, as it is possible a second stricture higher up may exist; which will prevent the hernia passing into the abdomen, and render your operation useless. The omentum, if small in quantity, may be left in the mouth of the hernial sac; it will most probably contract adhesions here, and thus prevent the formation of a future hernia. The edges of the wound are now to be closed by adhesive plaster, or one or two points of suture passed through the skin only, a little simple dressing laid on, and the patient returned to bed.

It frequently happens that this treatment of the intestine and omentum is not applicable—thus it may happen that the intestine is mortified, and not in a fit state to be returned. Mortification of the intestine is best ascertained by its breaking beneath the moderate pressure of the fingers; it is also frequently speckled with greenish spots.

Some have asserted that a dark-brown colour, and the loss of the smooth polished appearance of the serous membrane, are sure indications of its gangrenous condition: this is not the case, as the brown colour may be caused by the turgid state of the vessels, and the loss of transparency by the effusion of lymph on the serous surface. We should depend most on the degree of resistance possessed by the intestine when compressed between the fingers.

If it should be gangrenous, the stricture is to be divided, the intestine laid open so as to give exit to its contents and relieve the patient, and the wound covered with an emollient poultice. In favourable cases the sloughs separate, the wound granulates, and an artificial anus is formed, which may be subsequently got rid of by appropriate treatment.

Nor should the practitioner content himself with examining the part of the intestine exposed to view, he should draw the whole

carefully down, and ascertain that the pressure of the stricture has not caused an opening in the constricted part—this may occur even in cases where the rest of the intestine is perfectly sound; under such circumstances, the stricture is to be divided, and the hernia left unreduced*.

If one small aperture should have formed in the intestine, while the remainder is sound, the opening may be secured by raising the part with the forceps, and passing a small ligature round it, the intestine may then be returned.

Adhesions frequently exist between the intestine and hernial sac,—these, if recent and not extensive, may be at once broken through; if of longer standing, the knife may be used, taking care to infringe rather on the sac than on the intestine—should they be extensive, the intestines should be allowed to remain. In all cases the use of *force* should be avoided, as the intestine is easily ruptured.

The *omentum* too, occasionally causes the surgeon some trouble. It also may be adherent to the inner surface of the sac; if so, the adhesions should be freely divided, and it returned. Not unfrequently, if a large portion have descended, its folds unite so as to form one solid mass,—the return of such would be impossible, and if possible, exceedingly injudicious, as the presence of so large a foreign body (as it may be now considered) in the abdomen, would excite peritoneal symptoms. The plan to be adopted is, to remove the mass with the knife, and return the remainder to the mouth of the hernial sac, so as to plug up the opening. After the removal of the portion of the omentum, numerous vessels will bleed; the hemorrhage can be in general restrained by the laceration or torsion of the vessels with the forceps. Should this be found insufficient, the vessels that continue to bleed should be secured by ligature, taking care at the same time not to include any portion of the omentum. On no account should the omentum be returned until hemorrhage is completely restrained, as the warmth of the abdominal cavity will otherwise reproduce the bleeding. The ligatures may be allowed to hang out of the wound; they will separate in three or four days, or they may

* There is no occasion, as recommended by the older surgeons, for stitching the intestine to the edges of the opening, as adhesions almost invariably exist between these parts, which connect them closely together, and prevent the sudden retraction of the intestine into the abdomen.

be cut short; in the latter case they may ultimately either escape through the wound, or make their way into one of the intestines, and thus be discharged per anum.

Sir A. Cooper objects to the use of the knife in destroying the adhesions of the omentum, notwithstanding that he advocates the cutting away the omentum—we know not on what grounds.

The omentum is sometimes gangrenous; this condition of it may be ascertained by the blood being coagulated in the veins, by a peculiar crispy feel it presents, and by its giving way beneath the fingers. No green spots form upon it as on the intestine. The omentum is here to be removed close to the mouth of the hernial sac, and the vessels secured as before.

The old practice of placing a ligature on the omentum so as to cause its separation, cannot be too highly reprobated—it is a substitution of one species of strangulation for another.

If we are called to operate on a *large hernia*, we should content ourselves with dividing the stricture without opening the hernial sac; should we cut into the sac, a large serous surface is exposed, and most probably peritoneal symptoms will supervene. In these cases we are seldom able to reduce the hernia, from the extensive adhesions that exist; it must be left therefore *in situ*, and supported, when the patient recovers the operation, in a bag truss. Here the stricture is frequently at the external abdominal ring; in this instance there is little danger of wounding the epigastric artery, no matter what direction we give the knife: unless, indeed, we prolong our incision to a most unwarrantable length.

Inguinal hernia may be *strangulated in the inguinal canal*, before it has descended into the scrotum. As the tumour in such instances is much smaller than usual, they embarrass the surgeon not a little, especially if the hernia have only projected through the internal abdominal ring. Our incisions here must be made directly over the tumour, until we arrive at the intestine. The coverings will depend on the part of the inguinal canal in which the hernia is contained.

We saw a case in which two hernial sacs had descended one beside the other: one only contained a hernia. The tumour became strangulated, the operation was performed; and unfortunately that which did not contain the intestine was opened, whilst the other escaped observation. It was only at a post-mortem examination that the nature of the case was discovered.

HERNIA OF THE CÆCUM.

The *cæcum* has been found in an inguinal hernia. As this intestine wants the peritoneum posteriorly, this surface of it contracts adhesions to the scrotum, and cannot be returned.

When operating upon it, the peritoneum which the intestine has brought along with it, and which lies in front and to its inner side, must be cut through before it can be exposed. It is at once known by the appendix vermiciformis. It is possible that the posterior surface of the cæcum may present itself first to the surgeon, and thus the intestine be cut into in mistake for one of its coverings; the direction of the muscular fibres may point out the nature of the affection.

HERNIA OF THE BLADDER, OR CYSTIC HERNIA.

When the *bladder* protrudes in a hernia, there is no hernial sac; this viscus merely brings the peritoneum with it, which is related to it as in the natural state. We are not aware that any operation has been found necessary in such cases.

CONGENITAL HERNIA.

This form of hernia is a modification of oblique inguinal hernia; it takes place in consequence of the tunica vaginalis not having been obliterated at its superior part. The hernia thus descends into the cavity of the tunica vaginalis, where it lies in close contact with and beneath the testis. It is evident from this that no distinct hernial sac exists.

In order to explain this more fully, it must be recollect that the testis, at the early periods of foetal life, is an abdominal viscus. It commences its descent, or more properly speaking ascent, towards the scrotum, at the beginning of the sixth month, makes its way gradually along the inguinal canal, guided by the gubernaculum testis, and finally arrives in the scrotum, shortly before, or it may be, after birth.

From the partial covering which the gland receives from the peritoneum, it carries with it a duplicature of this membrane, which, in after life, is known as the tunica vaginalis.

Immediately after the descent of the testis, the upper part of the tunica vaginalis is closed by the adhesive inflammation, and ultimately degenerates into loose cellular tissue; whilst the lower

part forms a distinct sac (the tunica vaginalis) retaining all its original properties. Now it is evident that should an intestine be protruded downwards before this obliteration has taken place, it will descend into the tunica vaginalis, or bag of the peritoneum containing the testis.

Congenital hernia may be distinguished from common inguinal hernia, by the greater difficulty of distinguishing the testis in it, in consequence of the tunica vaginalis being thicker than the common hernial sac, the situation of the gland with respect to the hernia, namely, above and behind it; the wasting of the testis from the pressure of the hernia upon it, and by the adhesions which so frequently form between the hernia and the testis; as may be ascertained by attempting to return the former into the abdomen, when the testis will be found to ascend with it.

The operation for the relief of strangulated congenital hernia, differs but little from that recommended for the more common species. Sir A. Cooper advises three inches of the tunica vaginalis to be left undivided below, so as that the testis may be covered and unnecessary irritation avoided. Care must be taken in opening the sac, that the vessels of the chord, which are frequently spread out on its anterior surface, are not wounded.

INFANTILE, OR ENCYSTED HERNIA.

In this form of the disease the hernia is also contained in the tunica vaginalis, but has an immediate covering derived from the lymph that has been poured out by nature with a view to close the superior portion of the tunica vaginalis.

As we have already stated, immediately after the testis has descended into the scrotum, the process of obliteration commences in the upper part of the tunica vaginalis; a layer of coagulable lymph is thrown out, which adheres to the opposed surfaces of the peritoneum—against this layer of lymph the intestine is protruded. The lymph is sufficiently organized to prevent the intestine making its way through it, yet not strong enough to prevent its descent altogether; consequently the intestine carries with it the lymph, and thus the hernia receives from it an immediate covering or cyst, within the tunica vaginalis.

The operation does not differ from that recommended for congenital hernia. Both these forms of hernia may first present themselves in adult life.

INGUINAL HERNIA IN THE FEMALE

occurs much less frequently than in the male, owing to the smaller size of the inguinal canal. It descends into the labium, and is in general small. It is almost always reducible. Should it become strangulated, the operation will not differ essentially from that recommended for the male. The lower part of the peritoneal bag, according to Sir A. Cooper, contains only water. The incisions should not be prolonged much into the labium.

DIRECT INGUINAL HERNIA.

From the deficiency in the external oblique tendon, described in oblique inguinal hernia, under the name of the external abdominal ring, it follows that a hernia may be protruded directly forwards from the abdomen through this aperture, without traversing the inguinal canal; this will therefore form the direct inguinal hernia.

Fortunately nature has so protected this opening posteriorly, that this species is comparatively rare. The parts that oppose its formation lie behind the ring; they are, the triangular ligament or Colles's fascia, the conjoined tendons, the edge of the rectus muscle, and the transversalis fascia, attached to the outer edge of this muscle and to the conjoined tendons.

These barriers are not, however, in all cases sufficient. As a direct inguinal hernia makes its way forwards through the external ring into the scrotum, it pushes before it the peritoneum which forms the hernial sac; it next either bursts through, or carries with it, the transversalis fascia, and then passing to the outer edge of the rectus muscle and the conjoined tendons, it escapes through the external ring, and is here covered by the external spout-like fascia, the superficial fascia, and the integument. It is evident that the hernia can receive no covering (or at least a very partial one) from the cremaster muscle, nor from the fascia propria of oblique inguinal hernia, as it does not descend through the inguinal canal*. The epigastric artery, too, lies to its outer side; hence we divide the stricture in this form of hernia *upwards and inwards*. As the

* Sir A. Cooper states, it receives a covering from the transversalis tendon and fascia. By the former we consider him to mean an expansion from the transversalis fascia, where it is attached to the conjoined tendons.

hernia emerges from the external ring, it lies *internal*, and a little *posterior*, to the spermatic chord.

Direct thus differs essentially from *oblique* inguinal hernia in its *coverings*, and in its *relations* to the *epigastric artery* and *spermatic chord*.

When the hernia has been formed suddenly, we are enabled to distinguish the two forms of inguinal hernia, by the direct course backwards, which the direct species takes, into the abdomen. This, it should be recollect, will not always avail us, as in old cases of oblique inguinal hernia the two rings will be in close apposition; and thus a hernia, formed originally by oblique descent, will present the appearance of one by direct descent. As in the former the epigastric artery is drawn down to the external ring along with the hernial tumour, it still retains its original relation to the neck of the sac, namely, to its internal side; hence in all doubtful cases we should divide the stricture in a direction upwards.

If we examine the lower part of the parietes of the abdomen on their inner surface, by raising the intestines from the cavity of the pelvis, leaving the peritoneum *in situ*, we shall there see two depressions, or fossæ, on each side, which seem to invite, as it were, to the protrusion of a hernial tumour. Between these, three projecting chords may be noticed; one of these is situated on the mesial line, and is formed by the urachus, which ascends from the superior fundus of the bladder to the umbilicus; the remaining two are situated one on each side. They are formed by the degenerated umbilical arteries, which ascend from the lateral surfaces of the bladder, converging, to the umbilicus.

These depressions are named the *internal* and *external inguinal fossæ* or *pouches*. The *internal inguinal fossa* lies between the urachus and the degenerated umbilical artery, the first of which separates it from its fellow of the opposite side. It is triangular in shape, the base inferiorly being formed by the crest of the pubes. It lies opposite to the *external ring*, and thus leads to the formation of *direct inguinal hernia*.

The *external inguinal fossa* lies to the outer side of the umbilical artery; it lies superior and external to the other, and is somewhat larger; it leads to the *internal ring*, and consequently to the formation of an *oblique inguinal hernia*.

The projecting chords, formed by the urachus and umbilical

arteries, contribute more to the formation of hernia than the inguinal fossæ; as they, when the intestines are propelled against them by the action of the abdominal muscles, give to the propelling force, and consequently to the viscera, a direction forwards towards the fossæ.

FEMORAL HERNIA.

This form of hernia is more frequent in the female than in the male, in consequence of the greater breadth of the pelvis in the former. Although less frequently met with than inguinal hernia, it is perhaps more the subject of operation, as it is more liable to strangulation from the smallness of the aperture through which it escapes from the abdomen, and the resistance of the structures which form the circumference of the opening. We cannot but think that this strongly argues against the prevailing idea of the present day, that muscular structures are more likely to cause stricture than fibrous ones.

Femoral, or as it is sometimes named crural, hernia, is so called from its making its appearance, when first noticed, in the thigh; in the upper, inner, and anterior part of which region it descends, beneath Poupart's ligament, to the inner side of the femoral vessels.

To expose the anatomy of femoral hernia, raise the integuments from the anterior surface of the upper third of the thigh.

On doing so, we bring into view the *superficial fascia*. This is the common subcutaneous cellular tissue met with in every part of the body beneath the integuments—it is here well marked, and is frequently loaded with fat. On all sides it is continuous with the surrounding cellular tissue. Externally a few transverse fibres may be occasionally met with in it. No anatomist, so far as we are aware of, has as yet exercised his ingenuity in the vain-glorious task of dividing it into any definite number of layers. It forms the most superficial covering of a femoral hernia.

In the superficial fascia we notice several arteries, veins, nerves, and lymphatic glands. The *arteries* are branches of the external circumflexa ilii, external pudic and superficial epigastric arteries—they arise from the femoral artery a little below Poupart's ligament, perforate the cribriform fascia, and are lost in the superficial fascia and integuments. The external circumflexa ilii branches pass outwards behind the ilium; the external pudic to the organs of generation; whilst the superficial epigastric ascends inwards

over Poupart's ligament, to be lost in the parietes of the abdomen. The external pudic and superficial epigastric are frequently wounded in the operation for strangulated femoral hernia, and may require the ligature.

The *veins* are branches from the surrounding integuments, and the *great or internal saphena* vein. This large vein commences at the inner side of the foot and leg, ascends along the internal surface of the thigh, curves outwards at its upper part, and at about an inch and a half distance from Poupart's ligament, perforates the cribriform fascia, through the saphenic opening, to join the femoral vein.

In some cases a second large vein ascends along the anterior surface of the thigh, which either terminates in the saphena or in the femoral vein. In operating for strangulated femoral hernia, as well as in other operations in this region, the saphena vein is much exposed. It may be avoided by not prolonging our incisions too much inwards. Not unfrequently it becomes varicose, and may be mistaken for a femoral hernia.

The *nerves* met with in the superficial fascia are small branches derived principally from the anterior crural.

The *lymphatic glands* compose the inferior set of inguinal glands. They are arranged in the vertical direction, and consist of two sets, a *superficial* and *deep*. The *superficial* are three or four in number, and are enclosed in a capsule of the superficial fascia. The *deep* are two or three in number, they accompany the femoral vessels, one is almost constantly lodged in the femoral ring.

The inferior set of inguinal glands communicate with the absorbents of the lower extremity, hence they become enlarged in diseases of the foot, leg, or thigh; this enlargement should be most carefully distinguished from inflammation of the superior set of glands which communicate with the genital organs. Enlargement of the inferior set may be mistaken for a femoral hernia, and from their relation to the femoral artery, for an aneurism of this vessel.

Dissect off the superficial fascia. This may be accomplished with ease, until we arrive opposite the *cribriform fascia*; here the two are so intimately connected, that it is impossible to separate them without injury to one or the other.

On completing the dissection, the *fascia lata* is brought into view. This is a dense layer of fibrous structure which invests the muscles of the thigh. *Inferiorly* it is attached to the tendons and ligaments about the knee joint; from this it ascends, forming sheaths

for the different muscles, and sending in processes between them. Having arrived at the upper and anterior part of the thigh (where it is connected with the anatomy of femoral hernia), it divides into three portions, the *iliac*, *pectineal*, and *cribriform fasciae*.

The *iliac* (so called from its connexion with the os ilii) or *external* portion of the fascia lata, is the strongest; posteriorly it is attached to the crest of the ilium; in front we find it closely attached to the lower margin of Poupart's ligament. As we trace it inwards towards the pubes, it terminates in an elongated process, which passes in front of the femoral vessels, gets to their inner side, and is implanted into the front of the pectineal portion of the fascia lata. Some of its fibres are here reflected behind Poupart's ligament, they become continuous with the base of Gimbernat's ligament, and are inserted with it into the ilio-pectineal line. The *superior* edge of this prolonged portion of the fascia lata is attached to Poupart's ligament—its *inferior* margin is free and concave, the concavity looking downwards and inwards; this portion of it is named Hey's ligament, or the *falciform process* of the fascia lata, whilst its point of attachment to the pubic portion of the fascia lata is called Colles's ligament.

A short distance below Hey's ligament, the iliac portion of the fascia lata is gradually prolonged into the cribriform fascia, but not unfrequently presents, in the dissected state, a well-defined edge at the outer side of the femoral artery. Still more *inferiorly*, the iliac portion of the fascia lata becomes continuous with the pectineal portion in front of the femoral vessels; they here conjoined form a well-defined semilunar margin, the concavity of which is turned upwards, and forms Burns's ligament. This margin of the fascia lata, on a careful examination, will be found to be reflected backwards on the anterior surface of the femoral vessels, and so intimately united with the sheath, as to prevent altogether the descent of a hernia beneath it.

The *pectineal* or *pubic* or *internal* portion of the fascia lata lies in front of the pectineus muscle—*internally* it is attached to the symphysis pubis, where it lines the gracilis and adductor muscles; as we trace it outwards it passes in front of the pectineus muscle, gets behind the femoral vessels, at the outer edge of which it meets with the tendons of the psoas magnus and iliacus internus muscles: it here divides into two laminæ, one of which passes forwards, to be attached to the posterior surface of the external or iliac por-

tion of the fascia lata, whilst the other passes backwards to be attached to the capsular ligament of the hip joint.

Superiorly the pectineal fascia ascends in front of the pectineus muscle, to be inserted into the ilio-pectineal line, where it becomes continuous with the fascia iliaca, and with Gimbernat's ligament. *Inferiorly* it becomes continuous with the iliac portion of the fascia lata, to form Burns's ligament.

Femoral hernia, as it descends, rests on the pectineal fascia. Between these two portions of the fascia lata, and immediately in front of the femoral vessels, an oval-shaped space exists, which is covered over by a thin layer of cellular substance, named the *cibriform fascia*, or *middle* portion of the fascia lata. This is in general described as a process of the fascia lata, with which indeed it is perfectly continuous at the circumference of the opening; at the same time, it is so intimately connected to the superficial fascia, being in fact identified with it, that it may be, with equal propriety, described as being derived from this fascia.

The cibriform fascia is perforated, as its name implies, by a number of foramina, which transmit numerous veins and nerves, passing between the superficial and deeper parts. One larger than the rest is formed by the saphena vein dipping in to join the femoral; this is the saphenic opening; through it a femoral hernia most frequently passes forwards beneath the superficial fascia—it is bounded inferiorly by Burns's ligament. From the little resistance the cibriform fascia affords, a femoral hernia soon makes its way through it; this it effects either by bursting through the fascia, or dilating one of the openings in it, most frequently the saphenic opening.

Having thus examined the parts on the anterior surface of the thigh, we next proceed to ascertain by what means a hernia is enabled to escape from the cavity of the abdomen, so as to descend behind the fascia lata. For this purpose we draw the peritoneum and viscera out of the iliac fossa, and examine the parts which descend beneath Poupart's ligament. As this ligament stretches across the brim of the pelvis, between the anterior superior spinous process of the ilium and the tubercle of the pubes, it leaves a large space (the crural arch) between it and the bone, by means of which several structures are transmitted from the pelvis to the thigh, or in the opposite direction. Thus between the spines of the ilium, the inguino-cutaneous nerve descends internal to this;

the psoas magnus and iliacus internus muscles, and between them the anterior crural nerve, descend in a deep fossa ; still more internally the femoral vessels pass. On the inner side of these the absorbent vessels from the lower extremity ascend through a well-marked opening (the femoral ring).

So many parts thus passing beneath Poupart's ligament, nearly obliterate the space between it and the bone, so that the descent of a femoral hernia is, by these means, at least partially prevented. As, however, many interstices must exist between these parts, it becomes necessary that some additional structure should exist, in order to preserve the integrity of the abdominal cavity. This structure does exist, and is formed by the junction of the transversalis fascia and the fascia iliaca behind Poupart's ligament.

The *fascia transversalis* descends from the inguinal canal, passes backwards and behind Poupart's ligament, meets with the *fascia iliaca*.

This is a dense layer of fascia, which invests the anterior surface of the iliacus internus muscle; *externally and superiorly* it is firmly attached to the inner lip of the crest of the ilium. Tracing it *inwards*, it lines the muscle, passes behind the external iliac vessels, sending off at the same time an expansion, which passes in front of these vessels, binds them down, and forms the *fascia propria* of the external iliac artery, first described by Mr. Abernethy. At the inner side of the iliac vessels the *fascia iliaca* becomes attached to the ilio-pectineal line, whence it descends into the pelvis, under the name of the *pelvic fascia*. Near the pubes the *fascia iliaca* becomes continuous with the pectineal portion of the *fascia lata*, and Gimbernat's ligament. *Inferiorly*, or towards the femoral region, the *fascia iliaca* curves forwards, and meets the *transversalis fascia* immediately behind Poupart's ligament, where the two *fasciae*, united, form a dense whitish tendinous line, which indicating the course of the internal circumflexa ilii vessels, extends from the spine of the ilium to the outer edge of the femoral artery, and thus precludes the possibility of a hernial tumour descending between these points.

At the *outer* side of the femoral artery the *fascia transversalis* and the *fascia iliaca* separate ; the *fascia transversalis* descends into the thigh in front of the femoral vessels, whilst the *fascia iliaca* descends behind them, thus enclosing these vessels in a distinct well-marked sheath. This, the sheath of the femoral vessels, is of

a funnel shape; the base superiorly, the apex inferiorly, is gradually lost in the cellular coverings of the femoral vessels in the thigh.

The femoral artery and vein are not in close contact whilst contained in the sheath, but are separated by a septum or partition, which passes from its anterior to its posterior wall; and which, thus opposing the separation of these walls, prevents the descent of a hernia between the femoral vessels and the fascia transversalis, or anterior wall of the femoral sheath. In addition to this, the fascia transversalis is connected by cellular tissue to the cellular covering of the vessels, so as to assist materially in preventing the descent of a hernia in this direction.

On the *inner* side of the femoral vessels, we have just stated that a large aperture exists for the transmission of the absorbent vessels from the lower extremity. Here the provisions against the descent of a hernial tumour are but trifling, and here therefore it is that a femoral hernia first makes its way from the cavity of the abdomen. This opening is named the *femoral ring*, and should be attentively studied. It is as yet concealed from view by a delicate layer of cellular tissue, which may be described as the termination of the fascia transversalis, on the inner side of the femoral vessels. This forms the *fascia propria* of femoral hernia, inasmuch as a hernial sac, protruding through the femoral ring, carries the fascia before it, and thus receives from it an immediate investment or a *fascia propria*. Although in the natural state the *fascia propria* is thin and delicate, yet in old cases of hernia it becomes thickened and condensed, so as to present a membranous appearance. In some cases it may be burst through, so that no *fascia propria* will then exist. Mr. Guthrie has recorded an instance of this.

On removing the *fascia propria*, the *femoral ring* will be at once exposed. It is triangular in shape, the *base* externally at the femoral vein, the *apex* internally at Gimbernat's ligament; it is bounded in *front* by Ponpart's ligament, and the reflected portion of the falciform process of the fascia lata, *behind* by the horizontal ramus of the pubes, covered by the pectenius muscle and the pectineal fascia. The spermatic chord, or ligamentum teres, lies a little above and in front of it, and the epigastric artery curves to its outer side. In it we frequently meet with a lymphatic gland.

Here, then, is the unprotected part of the abdomen, through

which a femoral hernia descends into the thigh. As the hernia escapes through the ring, it pushes before it the peritoneum, which forms the hernial sac, as also the fascia propria, which, together with the lymphatic gland in the ring, affords but a feeble resistance; the latter is soon pushed aside, the former becomes one of the coverings of the hernia, which descending into the thigh beneath Poupart's ligament, rests on the pectineal fascia, behind the falciform process of the fascia lata. It soon arrives opposite the cribriform fascia. Its further descent is prevented by the convexity of the saphena vein, by the attachment of Burns's ligament to the front of the femoral vessels, and by the motions of the thigh on the pelvis. Meeting with little resistance from the cribriform fascia, it changes its course, turns *forwards*, bursting through the fascia, or dilating one of the apertures in it, most frequently the saphenous opening, and lies beneath the superficial fascia. It soon changes its course a second time, it now turns *upwards*, ascends over Poupart's ligament, and finally rests above this ligament, on Scarpa's fascia of inguinal hernia, which alone separates it from the tendon of the external oblique muscle. It is here then covered by the *integument, superficial fascia, fascia propria, and hernial sac.*

Sir A. Cooper states that a femoral hernia descends in the crural sheath, or sheath of the femoral vessels. This is a point of dispute that can alone be settled when the extent of the crural sheath is decided. Most assuredly it does not descend in that part of the sheath which contains the femoral vessels (and which should be alone called the crural sheath), as a distinct septum always exists between the hernia and the femoral vein.

We have stated that the femoral ring is bounded internally by *Gimbernat's ligament*. This is the third insertion of Poupart's ligament, from the pubic extremity of which it extends obliquely inwards and backwards, to be inserted into the ileo-pectineal line; it is triangular in shape, the apex turned inwards towards the pubes; its base is directed outwards, is semi-lunar, and forms the inner boundary of the femoral ring; one edge is turned forwards, and is attached to Poupart's ligament; the other is directed backwards and inwards, and is implanted into the ileo-pectineal line. Gimbernat's ligament is of use in preventing the descent of a femoral hernia on the inner side of the femoral ring. It is by many considered to be the seat of stricture in strangulated femoral hernia.

The femoral ring possesses in many subjects a relation which should not be overlooked; it is the *obturator artery*. This vessel

in general arises from the internal iliac artery. Where this is the case, it can have no relation to a femoral hernia; but in numerous instances it will be found to arise from the epigastric, close to the origin of this vessel from the external iliac artery.

Now as its ultimate distribution is to the parts in the neighbourhood of the obturator foramen, it necessarily follows, when such is its origin, that in order to arrive at this foramen, it must cross the femoral ring, and consequently a femoral hernia, if such should exist. As it proceeds to the foramen, it may either pass *directly* to it along the *outer* side of the neck of the hernia; or it may first pass along its *posterior* surface, and then enter the foramen; or it may wind along the *anterior* surface of the neck of the sac, and then descend to its *inner* side. Fortunately this last course is the least frequent of the three (occurring, according to Mr. Lawrence, but once in a hundred operations), as when the artery is so related to a femoral hernia, it is exceedingly difficult to avoid it, should we be called on to operate, particularly if the operator should prefer the division of Gimbernat's ligament for the relief of the stricture.

There is no point perhaps connected with femoral hernia respecting which surgeons are more at variance than as to what forms the stricture in this disease when strangulated. We have Gimbernat, Hey, Burns, and Colles, each contending that his ligament is the offender, so that the practitioner is left completely in doubt as to the true seat of constriction. Sir A. Cooper asserts that the stricture is seated in the "crural arch," and recommends the incision for its division to be directed upwards and inwards, thus dividing a part of the crural arch or Poupart's ligament. When we shall come to the description of the operation for the relief of strangulated femoral hernia, we shall mention the objections to this proceeding.

OPERATION FOR STRANGULATED FEMORAL HERNIA.

The remedies for the relief of strangulated femoral hernia do not differ from those made use of in inguinal or any other species of hernia; they are, the taxis, bleeding, tobacco enema, the warm bath, cold applications, &c. It is necessary, however, that these remedies should be had recourse to without delay, as this form of hernia, when strangulated, more rapidly hastens to a fatal termination, than any other. Sir A. Cooper has met with one case in which death took place in seventeen hours after the commencement of the strangulation, and other writers record many similar instances.

When making use of the taxis, two circumstances are to be particularly attended to, namely, the position of the patient, and the direction in which we press the tumour.

We have already said, when speaking of the reduction of inguinal hernia, that the patient is to be placed in such a position as that all the parts will be as relaxed as possible ; now this is to be particularly attended to in the reducing of a femoral hernia, in consequence of the attachment of the fascia lata to Poupart's ligament. Thus if the limb be extended and rotated *outwards*, it will be found that Poupart's ligament is rendered tense, and thus the boundaries of the femoral ring will be much straitened. If on the contrary the patient be placed in the semi-recumbent posture and the thigh flexed on the abdomen and rotated *inwards*, Poupart's ligament will be completely relaxed, so as to facilitate considerably the reduction of the hernia.

The next thing to be attended to is the direction which the hernia has taken from the abdomen. We should recollect that as it rests on the external oblique muscle above Poupart's ligament, the fundus of the hernia lies directly in front of its neck ; we should therefore first draw the tumour *downwards* until we have brought it opposite the cribriform fascia, then press it *backwards* through this, and then *upwards* through the femoral ring. Should we, forgetting the course of the hernia, press it at first either backwards or upwards, our efforts will be ineffectual, and of much injury, if not fatal, to the patient, as it is possible that the intestine may be ruptured by such violence.

It cannot be too firmly impressed on the mind of the practitioner that many diseases may be confounded with a femoral hernia, and that a correct diagnosis should be made before proceeding to the operation. Thus, for instance,

A varicose state of the saphena and femoral veins, near to Poupart's ligament, has been confounded with a femoral hernia. We can easily distinguish between them in the following manner. Place the patient in the recumbent posture, reduce the tumour, make pressure on the femoral ring ; if it be a hernia, the tumour will not reappear ; if it be a varicose state of the vein, the pressure will rather increase it. Again, if the pressure be applied *beneath*, the tumour will reappear on the patient's standing up if it be a hernia, but not so if it be a varicose state of the veins.

Enlargement of the inferior set of inguinal glands may be

confounded with a femoral hernia. In some cases we can recognise the glands by their circumscribed shape ; the absence of any neck to the tumour leading into the femoral ring, and their greater solidity ; in others, on the contrary, it is impossible to ascertain the true nature of the disease in consequence of the small size of the tumour, the fat condition of the patient, and the thickened state of the absorbents which pass through the femoral ring and simulate the neck of the sac. In such cases, should the symptoms of strangulation continue unrelieved, the surgeon is justified in cutting down on the tumour to ascertain its nature. We have known eminent surgeons to cut down on an enlarged gland in mistake for a femoral hernia. It should be borne in mind too that a hernia may be concealed behind an enlarged gland, which will add much to the difficulty of the diagnosis.

Psoas abscess pointing beneath Poupart's ligament may be mistaken for a femoral hernia. The two diseases have many symptoms in common, viz. the situation of the tumour, the impulse on coughing, their disappearance on the patient's assuming the recumbent posture. They may be distinguished, whilst the patient is in this position, by relaxing the abdominal muscles, and alternately pressing with each hand in the iliac and femoral regions, when, if the disease be an abscess, the fluctuation of the matter will at once point it out.

An *inguinal hernia* too may be confounded with a femoral, we distinguish between them by the relation of Poupart's ligament to them. In inguinal hernia, if we draw up the tumour, Poupart's ligament may be in general distinctly traced with the fingers from the ilium to the pubes; but, on the contrary, if we draw it downwards on the thigh, the hernia is felt crossing the ligament. If the disease be femoral, the elevation of the tumour will cause it to cross Poupart's ligament; its depression will leave the ligament free.

We may here remark that we have never seen any difficulty as to the diagnosis between an inguinal and femoral hernia, when the disease was of the inguinal species.

Having satisfied ourselves that the disease is strangulated femoral hernia, and that the operation is indispensable, we proceed to its performance.

Place the patient in the horizontal posture on a table of convenient height, with his legs hanging over its edge, and his shoulders a little elevated. Make the first incision along the tumour, in a nearly transverse direction, about half an inch below Poupart's li-

gament*, from the centre of this carry your second incision about two inches and a half in length upwards toward the umbilicus, you will thus have made a wound of an inverted T shape (L), dividing the integument, and bringing into view the superficial fascia. In this the external pudic and superficial epigastric arteries may be divided; if the hemorrhage be troublesome, they should be secured with the ligature. Take care to avoid the saphena vein, which lies a short distance beneath your transverse incision.

Next proceed to divide the coverings of the hernial tumour, viz. superficial fascia, fascia propria, and hernial sac, in the cautious manner recommended when speaking of inguinal hernia.

The contents of the sac having been exposed, you proceed to ascertain with the little finger the seat of stricture; this is at the femoral ring, but at what part? This is a question extremely difficult to decide upon. Sir A. Cooper directs us to cut upwards, forwards, and inwards, taking care to draw the spermatic chord out of the way if we operate on the male subject. Mr. Colles advises the division of the "pectineal attachment of the fascia lata." Gimbernaut advocates the division of the base of the third insertion of Poupart's ligament, and this we may say is the operation preferred at the present day.

It is accomplished by drawing the intestines outwards, and introducing the probe-pointed bistoury on a director (if that can be accomplished, if not on the finger), and then cutting directly inwards through the base of Gimbernaut's ligament. The stricture being divided, the hernia is to be returned, which may be accomplished without difficulty if no stricture exist in the neck of the sac. If this should be the case, it must be divided, and thus the hernia reduced.

The principal objection to this method of operating arises from the risk of wounding, in its performance, the obturator artery when it arises from the epigastric, and crosses the front and inner side of the hernial sac. This variety in the course of the artery is so very rare as to constitute no solid objection to the practice; indeed the artery may be avoided even when it takes this course, by making use of a bistoury resembling Sir A. Cooper's blunt-pointed bistoury, but differing from it in having a cutting edge of only three or four lines in extent. By this means the ligament can alone be cut; a very slight incision being sufficient for our purpose. The

* Sir A. Cooper recommends the incision to be made along Poupart's ligament.

cutting of the ligament is at once ascertained by the operator by the peculiar feel it communicates to his hand.

The plan recommended by Sir A. Cooper, of cutting the stricture upwards, forwards, and inwards, exposes the spermatic chord, and consequently the spermatic artery, to injury in the male subject. It also, by dividing Poupart's ligament, weakens the lower part of the abdomen. It is true, the vast experience of this eminent surgeon gives to any recommendation from him an authority that should be opposed with diffidence; yet we must recollect that this very experience enabled him to perform operations with safety, that might in less skilful hands be attended with considerable difficulty and danger. Hence surgeons prefer the operation recommended by Gimbernat, and this, there can be no question if properly performed, will be sufficient, as by it we *enlarge the femoral ring*, which is all that is requisite to the reduction of the hernia.

On no account should we cut upwards and *outwards*, as the epigastric artery and femoral vein lie in this direction.

It has been proposed of late years to divide the stricture external to the hernial sac, and then to return the whole into the abdomen. Such a proceeding is impossible, as the sac contracts adhesions immediately after its descent to the surrounding parts; and even were it possible, it is highly objectionable, as it frequently occurs that the stricture is situated in the neck of the sac, or it may be in its interior, and thus the hernia will be returned without the strangulation having been removed.

We have elsewhere* advocated the practice of dividing the stricture external to the hernial sac, and then compressing the outer surface of the sac, so as, if possible, to return its contents. If we succeed, our object is accomplished; if not, it is evident that the stricture exists internally, and therefore it becomes necessary to lay open the hernial sac, in order to remove the constriction.

This method of operating approaches nearer than any other to the reduction of the hernia by the *taxis*, and by it we avoid wounding the peritoneum. Thus this operation is less likely to be followed by peritonitis than those in which the membrane is divided. It is true that many cases are recorded of wounds of the peritoneum, which were not followed by any untoward symptoms, but these only constitute exceptions to a general rule, and cannot

* *Lancet*, 1837.

be received in opposition to the experience of ages. One objection to the proceeding is, that the hernia may be strictured in the interior of the sac by the omentum; but as this objection applies equally to the reduction by the *taxis*, it need not occupy us.

UMBILICAL HERNIA, OR EXOMPHALOS.

This species of hernia is but rarely seen in the adult; it is, however, of frequent occurrence in children immediately after birth, in consequence of the cries of the child, and the open state of the umbilicus. It then protrudes through this aperture into the umbilical chord to the distance of an inch or more, and may be distinctly recognised through its coverings.

The disease in adults termed umbilical hernia, is in the great majority of cases a ventral hernia, as it protrudes not through the umbilicus but above it, through the linea alba, which here, from the divergence of the recti muscles, presents a less degree of resistance than beneath the umbilicus. In corroboration of this statement the umbilicus, in almost all cases of umbilical hernia in adults, may be seen on one or other of the surfaces of the tumour, which is not the case in the true umbilical hernia.

Occasionally umbilical hernia may present itself in the adult, but this occurs only in cases where, from the protrusion of a hernia in infancy, or from other causes, the umbilical opening has lost that tendency to contract which it possesses after birth; once closed, this opening becomes the least yielding portion of the soft abdominal parietes.

The anatomy of umbilical hernia is simple. It is covered by the integuments, superficial fascia, and peritoneum. The peritoneum, and sometimes the superficial fascia, become absorbed, so that the coverings of the hernia are exceedingly thin. Much care then will be required on the part of the surgeon when operating, not to wound the intestine. Some have altogether denied the existence of a hernial sac in this form of hernia, but there can be no doubt of its existence, at least for a short time after the formation of the disease.

When reducible, it should be at once returned, and retained in the abdomen by "means of one half of an ivory ball," or a piece of cork cut in this shape, "applied to the umbilicus, and over this adhesive plaster and a belt, which should be supported by straps

round the lower part of the belly and the thighs. A little waist-coat fastened by two strings will be of use." It should be borne in mind, that if the disease be allowed to continue unreduced for any lengthened period, the umbilicus will lose its tendency to contract, and thus the parts will be ever afterwards liable to a recurrence of the disease. The hand will in general suffice for its reduction, but if large, the pressure of a large wooden platter laid on the abdomen will be required.

Desault has recommended the application of a ligature round the base of the hernial tumour in children, taking care to include only the skin and sac. Such practice is now not approved of, as it is frequently followed by very violent and even fatal symptoms; and even in the most favourable instances requires the use of the bandage and compress for some months after, the judicious application of which, without any operation, will be always found effectual. Scarpa has observed, that the umbilical hernia, and those of the linea alba, are less subject to be strangulated than the inguinal and femoral hernia; but that when they are unfortunately afflicted with strangulation, the symptoms are more intense, and gangrene comes on more rapidly than in every other species of rupture.

When umbilical hernia becomes strangulated, the usual remedies for the relief of strangulated hernia should be resorted to. Of these the tobacco enema is the most effectual, and should never be omitted, as it has a greater effect in relaxing the muscles, and taking away the cause of stricture, in this than in any other kind of hernia.

Should these remedies fail, the stricture must be divided; for this purpose an incision of an inverted T shape (L) is to be made over the tumour, the integument dissected off, and the hernial coverings carefully divided. The sac (if it exist) having been opened, the stricture is to be divided at the superior edge of the opening, in a direction upwards and a little to the left side, in order that we may avoid the umbilical vein, which lies to the right side, and the hernia be returned. The after treatment is the same as that in use for other herniae. Some surgeons advocate the division of the stricture, and the reduction of the hernia, without opening the hernial sac.

VENTRAL HERNIA.

This form of hernia may occur in any region of the abdomen, but most frequently appears in the linea alba, between the recti muscles, immediately above the umbilicus. It may also protrude through the lineæ semilunares, or in the openings to be observed in the aponeurosis of the external oblique tendon. These apertures in the natural state give transmission to small pedicles of fat, which increasing in size may be mistaken for a hernial tumour. Should they afterwards become absorbed, it is possible that the hernia may protrude through one of the dilated openings, and so occupy the place of the fatty tumour.

From the proximity of hernial tumours to the umbilicus, when they occur in the linea alba, they are frequently confounded in the adult subject with umbilical hernia. They may be in general distinguished by the oval shape of the neck and body of the ventral tumour; these being in the umbilical spherical; and also by the presence of the umbilical cicatrix on one side of the former. The treatment of these tumours is similar to that recommended for umbilical hernia.

OBTURATOR OR THYROIDEAL HERNIA

is a disease of rare occurrence; it is formed by a portion of intestine or omentum protruding through the thyroid or obturator foramen.

In the case which Sir A. Cooper met with, the hernia descended above the obturatores muscles. The os pubis was in front of the neck of the sac, three-fourths of it were surrounded by the obturator ligament, and the fundus of the sac lay beneath the pectenius and adductor brevis muscles. The obturator nerve and artery were situated behind the neck of the sac, a little towards its inner side. This form of hernia protrudes into the upper and inner part of the thigh, where it is only recognised when large, and in thin individuals.

If reducible, it should be reduced, and retained so by means of a truss; if strangulated, an operation might be performed for its relief by cutting down to the obturator foramen, immediately above Poupart's ligament, taking care to avoid the spermatic chord, the peritoneum, the obturator and epigastric arteries.

SCIATIC HERNIA.

A case of this kind occurred to Dr. Jones, and is recorded by Sir A. Cooper, in the second part of his work on Hernia. The young man in whom it occurred died from its becoming strangulated. It was not discovered until after death. The hernia was found to have protruded through the upper part of the sciatic notch, above the sciatic nerve, on the fore part of the pyriform muscle. The sac lay under the glutæus maximus muscle, and its orifice was before the internal iliac artery, below the obturator artery, but above the vein.

Sir A. Cooper remarks, that a reducible hernia might be kept up with a spring truss, and that if an operation were requisite, the orifice of the sac should be dilated directly forwards.

DIAPHRAGMATIC OR PHRENIC HERNIA

is formed by the viscera being protruded upwards through the diaphragm, either through some of the natural openings in this muscle, or through congenital deficiencies, wounds, or lacerations in it. It is wholly beyond the reach of art.

PERINEAL HERNIA

protrudes into the perineum between the bladder and rectum in the male, between the vagina and rectum in the female, in which latter sex it much more frequently occurs. The hernial tumour is occasionally prominent in the vagina, whence it is often named vaginal hernia. It should be kept reduced by means of a pessary.

PUDENDAL HERNIA.

This name has been assigned by Sir A. Cooper to a species of hernia which descends between the vagina and ramus of the ischium, to the labium pudendi. It is of extremely rare occurrence.

Wounds of or deficiencies in the abdominal parietes, frequently give rise to hernia; and hence, as this disease may present itself in any part of the abdomen, the surgeon should always be on his guard when a tumour presents itself at all resembling a hernia.

ON HERNIA IN GENERAL.

From the importance of the parts connected with hernia, at least to the individual afflicted with the disease; from the great liability there exists of its becoming strangulated, and so exposing the patient to a dangerous operation; from the fatality which so frequently follows the operation, even in the hands of the most skilful, it is evident that no disease calls more loudly upon the profession, for a strict acquaintance with its pathology, and for the most strenuous exertions to place it in such a condition as may be least likely to be attended with unpleasant symptoms.

Important as this disease may be to the unhappy sufferer who labours beneath it, no less so is it to the practitioner, who would pursue his professional career with benefit to his patients, and with honour and advantage to himself. Other diseases which demand an operation for their removal or cure, admit of a little delay, which may be profitably employed by the surgeon in recalling to his mind the anatomy of the parts engaged in the operation; but here is one, in which delay is often death, and on which the practitioner may be called to operate at the midnight hour, without warning, without preparation, without assistance. How culpable is he, who wholly ignorant of the anatomy of the part, proceeds to a most complicated dissection, and risks his knife in his too confiding patient, without being able to distinguish between a fascia and a peritoneal sac! He proceeds with timidity, incision after incision is made, whilst he anxiously expects that each one will expose the object of his search; until at last mistaking the hernia for one of its coverings, he plunges his knife into its cavity, and thus becomes accessory to the death of his patient. Or what is more probable, with that impudence which is too often the handmaid of ignorance, he cuts with bold indifference, until at last a torrent of blood announces to him he has opened a bloodvessel of magnitude. Behold him now! ignorant as to whence it is derived, or what the course of the vessel he has wounded may be, he drops his knife—compress upon compress is stuffed into the wound; the blood now flows into the abdomen; the operator hurries from the scene of devastation, happy that he has concealed from public view the result of his ignorance; still more happy in being enabled to escape the prospect of his victim gradually sinking before his eyes. But this picture is, I am satisfied, of rare occurrence. Few surgeons are now to be met with unacquainted with anatomical

details, and fewer still who would so hazard his patient's life and his own reputation.

We have already stated that a hernial tumour may be met with in a reducible or irreducible state; we shall now proceed to point out the treatment necessary under these circumstances; and, first:

REDUCIBLE HERNIA.

There is no period of life wholly exempt from hernia; it may occur in the infant, the adult, or the aged; it is however much more frequent at the first and last periods than at the second.

Several circumstances conspire to render hernia, especially the inguinal species, of frequent occurrence in the infant. Thus the open state of the inguinal or spermatic canal, which has just transmitted the testicle into the scrotum, the want of adhesion in the upper part of the tunica vaginalis, and the trifling degree of obliquity in the canal, which is at this period of very short extent indeed, favour the descent of a hernial tumour. In addition to these may be enumerated the want of development of the pelvic cavity, which as yet is not sufficiently capacious to receive the small intestines, which thus are lodged in the abdomen, and are therefore the more directly under the influence of the abdominal muscles and diaphragm so frequently called into exercise in the infant. At this period of life too the pelvis descends almost vertically from the spinal column, so that its superior opening looks almost directly forwards. Thus the viscera want the support of the brim of the pelvis inferiorly, and are protruded against the abdominal parieties, which frequently give way.

In the adult this combination of circumstances no longer exists, the spermatic canal becomes elongated, by the spreading outwards of the crests of the ilia, the tunica vaginalis is closed superiorly, the pelvis has become sufficiently developed for the reception of the intestines, and its anterior brim, from its great increase in size, and the peculiar rotation which the pelvis is known to undergo as the individual advances to maturity, receives the impulse communicated to the the intestines from above by the diaphragm and abdominal muscles. Here too the parietes of the abdomen possess that degree of strength and integrity which is wanting in either the infant or old subject.

This alteration in the several parts enumerated is not only interesting as showing that there is a natural disposition in the

animal economy of the growing subject to remedy the apparent imperfections which exist in the infant, but it is important as it points out to us that it is while these changes are going forwards that we are most likely to effect a cure of the disease, and that therefore the most strenuous exertions should be made by the practitioner and the patient, to aid nature in her restorative process, by those means which art has recommended.

If, however, the adult be by nature so perfectly protected from the occurrence of a hernia, he is more likely to indulge in violent exertions, which frequently produce the disease, than the youthful or aged; he is too more exposed to accidents, and thus herniæ are occasionally met with in the otherwise healthy adult. On attentively considering these circumstances, it becomes evident that a hernia in the middle-aged is more likely to be produced by violence than by a gradual yielding of the abdominal parietes, and therefore will be much more in danger of strangulation. The female adult has an additional cause for the formation of a hernial tumour in the occasionally impregnated uterus, which forces the intestines upwards out of the pelvis, encroaches itself on the abdominal cavity, and by its progressive distension produces a yielding of the parietes of the abdomen, which is too favourable to the future occurrence of hernia.

In the old subject (second childhood) the predisposition to the formation of hernia becomes re-established, but from other causes. At this period of life corpulency too often exists, the omentum becomes loaded with fat, and the intestines are thus forced by the intruder from their natural retreat to seek an asylum in the scrotum or elsewhere. Now, also, the abdominal parietes begin to yield, the abdominal rings give way to the frequent impulse of the viscera forced against them by the contraction of the surrounding muscles, so often excited by the many diseases of the thoracic and pelvic viscera to which age is subject.

But as human nature is subject to few griefs without some compensating joys, the dilatation of the rings so produced renders hernia, at this period of life, not only much less likely to become strangulated, but also less acute in its symptoms when constricted.

Other causes of hernia, besides those mentioned, occasionally exist; these are, a congenital weakness or malformation, the growth of tumours in the abdomen, and wounds of the abdominal parietes.

Hernia, it has been remarked, is more frequently met with on

the right than on the left side; this may be accounted for by the greater use that is made of the right side of the body*, and also by the oblique descent of the diaphragm from left to right, caused by the presence of the liver in the right hypochondriac region.

TREATMENT OF REDUCIBLE HERNIA.

Having said so much respecting the causes of hernia, its treatment need occupy but little of our attention. It is, in a word, to remove these causes, if possible; and where this cannot be effected, to keep the viscera *in situ* by the application of a truss, or other means.

The general symptoms of a reducible hernia are, an indolent tumour in some of the regions of the abdomen mentioned, produced either spontaneously or by some violent exertion, the absence of any discoloration of the integuments, the appearance of the tumour in the erect, its disappearance in the recumbent posture, the impulse communicated to it by coughing, and its increase in size at the same time, its diminution when compressed, and occasionally some colicky pains in the abdomen.

When the tumour is composed of intestine only (enterocele), it may be distinguished from an omental hernia (epiplocele), by the irregular unequal doughy feel of the latter, as also by its greater indolence and compressibility. If in the scrotum the omental hernia is more oblong and less round than the intestinal, its weight is also greater.

When the disease is an entero-epiplocele, that is, composed of both intestine and omentum, the diagnosis is more obscure. Indeed, in most cases, the best experienced surgeons find it exceedingly difficult, if not impossible, to distinguish the contents of a hernial tumour, nor is it a matter of any great importance, as equally acute symptoms may be induced by an omental as by an intestinal hernia. The return of an intestinal hernia is frequently, but not always, attended with a peculiar gurgling noise.

When the hernia is reducible, it should be at once returned into the abdomen, and retained there by means of a truss. The manipulation necessary for its reduction is termed the *taxis*. In all attempts at reduction, the patient should be placed in such a position as will most effectually relax the parts through which the hernia has descended, and this then returned gradually, that is,

* This may be questioned.

the portion of intestine that has last descended should be first returned, kept so by means of gentle pressure on the part, and so on until the whole tumour disappears; when reduced, the pad of the truss should be applied over the opening through which *the intestine has escaped from the abdomen*. For example, in oblique inguinal hernia, it should be placed on the internal and not on the external ring. If placed over the external ring, the hernia will be still contained in the inguinal canal, where it is extremely liable to become strangulated, and the pad of the truss when applied here may injure the spermatic chord.

By a perseverance in the constant use of the truss, we have reason to expect a perfect cure of the disease from the pressure causing an obliteration of the hernial sac, and the contraction which takes place in the internal ring, when the viscera are prevented from descending through it. In the young subject, as just explained, other circumstances assist in the removal of the disease. When the truss has been worn for some time, there is still greater danger of a strangulation ensuing, should it be laid aside and the hernia descend, than previous to its first adoption; this arises from the partially contracted state of the opening, and the thickened state of the peritoneum, induced by the pressure of the pad. Hernia can in general be easily reduced in infants, as the inguinal canal is short, and possesses but little obliquity; it is seldom strangulated, yet Mr. Pott states he has seen an infant of a year old die of a strangulated hernia.

In *congenital hernia*, where the testis has not as yet descended, Sir A. Cooper recommends the truss not to be applied until after the testis has descended into the scrotum.

It frequently happens, that from a thickened state of the omentum or mesentery, from adhesions to the hernial sac, or from other causes, a hernia cannot be returned; it then becomes an

IRREDUCIBLE HERNIA.

There are three states or conditions in which an irreducible hernial tumour may be found; thus it may be either *simply irreducible*, *incarcerated*, or *strangulated*.

SIMPLY IRREDUCIBLE HERNIA is that form of the disease which, although it cannot be reduced, is not attended with any serious symptoms.

The patient should in this case wear a bag truss, which will have

the effect of supporting the tumour, and opposing the protrusion of any more of the viscera. Where the hernia is composed of omentum only, moderate pressure may be tried, as it has been found to cause an absorption of the protruded omentum and the gradual return of the hernial sac into the abdomen.

It is evident that great care will be required in the use of the pressure, as otherwise it might be applied where an intestine forms part of the tumour, or it may bring on an inflammation of the omentum, and thus induce general peritonitis. In some cases where the hernia is large and of long standing, the abdominal cavity has become contracted, or a deposit of fat has taken place in its interior, which will materially oppose the reduction of the hernial tumour. Here, if our patient be very anxious to get rid of the disease, the moderate use of opening medicines, blood-letting, and a strict regimen, may give rise to an absorption of the adipose matter, so as to produce a diminution in the size of the hernial tumour, and afford room in the abdomen for its return, which will contribute much to the facility of the reduction of the hernia. Mr. Hey has several times succeeded in this way.

Sir A. Cooper recommends the repeated application of cold to the tumour, which he has found beneficial, by causing a diminution in its bulk, thus conduced to its final reduction.

INCARCERATED HERNIA.

In this form of the disease the hernial tumour is so constricted as to interfere, to a moderate extent, with the functions of the intestines.

It rarely occurs, except in cases of old irreducible hernia, and is most frequently produced by a collection of feculent matter, or of air in the cavity of the intestines. It may be also caused by an increased deposit of fatty matter in the protruded omentum pressing on the intestines, or from an additional portion of intestine or omentum having been forced into the hernial sac.

Incarceration is a condition of the hernial tumour which requires immediate attention, as if allowed to continue in this state for any length of time, more acute symptoms will at last supervene, and thus the patient will be obliged to submit to an operation for its removal. Nor can we expect otherwise. The constriction of the intestine produces inflammation of the parts protruded; they become swollen, and thus increase the constriction; the inflammation

spreads to the interior of the abdomen, and all the symptoms of strangulated hernia set in.

The *treatment* of this form of hernia consists in the judicious use of opening medicine, the administration of enemata, and the use of warm or cold applications to the tumour. The former of these act by relaxing the tension of the parts, the latter by condensing the air in the interior of the intestine. More active remedies can seldom be resorted to, as the patient is in general advanced in life. Nor indeed are the symptoms sufficiently acute to demand, or be benefited by bleeding, or other violent remedies.

STRANGULATED HERNIA.

A hernia is said to become *strangulated*, when it is not only irreducible, but when it is so much constricted as that the circulation in the intestine or omentum is either impeded or wholly prevented. Sir A. Cooper asserts that some portion of blood is still capable of being carried to the part by the arteries, but it cannot be returned by the veins. It is evident that this is an error, as the stagnation of the blood in the veins will prevent the circulation in the arteries : unless, indeed, that some of the anastomosing arteries perform the office of veins.

The *symptoms* of a strangulated hernia commence with a sense of pain about the region of the diaphragm, as if a cord were bound tightly round the upper part of the stomach. This is soon followed by eructation of air from the stomach and intestines. The patient is next troubled with vomiting and constipation of the bowels *. At first the contents of the stomach are evacuated, afterwards dark greenish bile from the duodenum, and finally, if the stricture be on the large intestine, the faecal matter which constitutes stercoraceous vomiting.

Soon after the commencement of the strangulation the abdomen becomes distended with air collected in the cavity of the intestines, but is not painful ; the pulse is hard, frequent, and incompressible. As the disease advances, colicky pains appear throughout the abdomen. These are at first transient, but soon increase in strength and frequency until they are at length followed by a fixed pain.

* It should be impressed upon the mind, that discharges of feculent matter will take place from the intestines below the stricture, or even may come from any part of the intestinal tube, where the omentum only, or a portion of the caliber of the intestine becomes strangulated.

The *abdomen* now becomes not only tense, but tender to the touch ; the patient lies on his back with his limbs drawn up, and his head supported, that he may relax the abdominal muscles ; the bowels are still constipated, the vomiting and eructation continue ; the pulse becomes hard, frequent, and *wiry*, and the patient is covered with a cold perspiration. The *tumour* now becomes very tense and hard, in general a little inflamed on the surface of the skin, and tender to the touch.

In this stage the most active treatment becomes necessary. The warm bath, heated from 90 to 100 degrees, bleeding ad deliquium, purgatives, emollient enemata, opiates, cold applications to the tumour, and the tobacco enema, should be had recourse to, if the case will admit of sufficient delay for their adoption.

In the selection of these various remedies the practitioner must be guided by the peculiarities of the case, as treatment which will be of much benefit in one may be fatal to another. Thus if the patient be young and plethoric, and the strangulation acute, bleeding, and the warm bath used for ten or fifteen minutes, so as to induce fainting, will be of much service in relaxing the tension of the parts, and in controlling the peritoneal inflammation ; whereas in the old subject and in chronic strangulation, their adoption may sink the vital powers, and lead to a fatal termination. So is it with the tobacco enema.

The use of purgatives is condemned by some, on the grounds that they will not rest on the stomach, and rather increase the irritability of this organ, yet they will be found useful in the chronic strangulation. Opiates are not often resorted to. The best form of cold application to the tumour, is pounded ice contained in bladders, or when this cannot be procured, a mixture of equal parts of nitre and muriate of ammonia, say ten ounces of the mixed salts to one pint of water. Ether allowed to evaporate on the surface of the tumour forms a good substitute for these remedies. Care must be taken that the cold be not so applied as to freeze the scrotum, and bring on sloughing.

The tobacco enema should be made by infusing one drachm of the leaf in a pint of boiling water for ten minutes. Half of this only is to be administered at first ; the remaining half may be given after the interval of an hour, should the first not produce the desired effect. The tobacco smoke is more troublesome in its application, and less certain in its effects.

Advantage should be taken of the weak state of the patient induced by these several remedies, and the taxis tried.

What length of time may we safely expend in our attempts at reduction before we proceed to the operation? To this question, perhaps the most important connected with hernia, no definite answer can be given. It depends altogether on the nature of the case, the form of hernia, the age, the constitution of the patient, and the urgency of the symptoms. Thus we can wait longer in the chronic than in the acute strangulation, in the old than in the young subject, in oblique inguinal than in direct inguinal or femoral hernia, and in cases of long standing. Larrey relates a case that proved fatal in two hours, whilst others have occurred where many days have passed over before the operation was performed, and yet with success.

On this subject the words of Mr. Hey are invaluable: that eminent surgeon says:—"I have now, at the time of writing this, performed the operation thirty-five times, and have often had occasion to lament that I had performed it too late, but never that I had performed it too soon." After the operation an enema should be administered to the patient, so as to bring on a discharge from the bowels, and all symptoms of peritonitis combated by the antiphlogistic treatment.

If the operation be not performed in proper time, gangrene will take place. All the symptoms now undergo a complete revolution; the patient will say perhaps that he is much better, that he has got rid of all his pain, but a little examination will satisfy the practitioner that death is fast approaching. The pulse becomes weak, intermitting, and easily compressed, the abdomen becomes less tense and tender, the patient gulps the fluids from his stomach without any action of the abdominal muscles, and the skin is covered with a clammy perspiration. The tumour may be perhaps, by a little pressure, returned into the abdomen, it feels emphysematous; the bowels become relaxed, and hiccough supervenes *. In this state but little can be done, the tumour should be cut into so as to give exit to its contents, and expedite the separation of the sloughs. The recovery of the patient is possible by the formation of an artificial anus.

* The appearance of hiccough in the *advanced* stage of strangulated hernia is a bad symptom; it may however appear in the *early* stage, and yet the case terminate favourably.

POST-MORTEM EXAMINATION.

On cutting into the abdomen of a patient that has died of strangulated hernia, a quantity of air immediately escapes from the *peritoneal cavity*; the intestines appear as if they had been *tossed about* in the abdomen; those above the stricture are much distended, whilst those below it are contracted. The *surface of the peritoneum*, especially where it invests the intestines, is covered irregularly with a brownish coloured tenacious lymph, which glues the viscera together.

The *pelvic cavity* contains a quantity of brownish-coloured serum. The intestines, where the convolutions touch each other, "have a red line upon them." On removing the lymph which covers the intestines, they appear more vascular than is natural. When the hernial sac is cut into, a quantity of lymph is found in the surrounding cellular tissue, and if gangrene have taken place, the parts will be emphysematous, and pit on pressure. A large quantity of serum will be found in the *hernial sac*, especially if intestine be present. The *omentum* is dark-coloured, and if gangrenous gives way to pressure, and emits a highly putrefactive odour. The *intestine* is covered with a layer of coagulated lymph. If gangrenous, *small green spots* will be seen upon it; it also yields to pressure.

